U. S. DEPARTMENT OF AGRICULTURE.

FARMERS' BULLETIN No. 131.

HOUSEHOLD TESTS

FOR THE

DETECTION OF OLEOMARGARINE AND RENOVATED BUTTER.

BY

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LETTER OF TRANSMITTAL.

U. S. Department of Agriculture,
Division of Chemistry,
Washington, D. C., May 25, 1901.

Sir: I have the honor to transmit herewith an article entitled Household Tests for the Detection of Oleomargarine and Renovated Butter, and to recommend its publication as a Farmers' Bulletin. The paper was prepared by Mr. G. E. Patrick, an assistant in this Division, and describes two tests which enable any housekeeper, with only the usual facilities of the kitchen, to distinguish in the great majority of cases between genuine butter, renovated butter, and oleomargarine.

Respectfully,

H. W. Wiley,
Chief Chemist.

Hon. James Wilson,
Secretary of Agriculture.

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HOUSEHOLD TESTS FOR THE DETECTION OF OLEOMARGARINE AND RENOVATED BUTTER.

RENOVATED OR PROCESS BUTTER.[1]

Oleomargarine is no longer a novelty to Americans; its composition and method of manufacture have become matters of common knowledge. Renovated or "process" butter, on the other hand, having been introduced in a large way hardly more than five or six years, and being retailed usually without other designation than the general one of "butter," is as yet hardly known to the general public. All grades of it—good, indifferent, and bad—are met with in our markets. The better grades of it are made from miscellaneous assortments of "country butter," mainly "farmers' rolls," produced by individual farmers remote from creameries and sold or exchanged at the country stores, this material being treated or "processed," as the term is, while still fresh or relatively so. The poorer grades result from the treatment of inferior raw material; for example, the aforesaid "country butter," or any other kind of butter, which, by too long keeping, by abuse in regard to temperature, or by unfavorable surroundings, has suffered great deterioration. Experience has shown that only a poor article of renovated butter can be produced from rancid "stock."

HOW RENOVATED OR "PROCESS" BUTTER IS MADE.

The process may be briefly outlined as follows: Melting of the butter and settling of the curd and brine, skimming off of froth and scum, drawing off and discarding of the curd and brine, blowing of air through the molten fat to remove faulty odors, mixing of milk very thoroughly with the molten fat, rapid cooling and "granulating" of this mixture by running it into ice-cold water, draining and ripening of the granulated mass for a number of hours, salting and working out of the excess of milk, packing or making into prints.

By this process, when used upon comparatively fresh raw material, butters of low grade are materially improved, the farmer's revenue is increased, values are enhanced—in short, a good thing is done. Harm begins only when the renovated is sold for the genuine (that is, the

[1] Also known locally in New England as "sterilized" butter.

original) article, for they are not the same thing. While the fats in the two are practically the same chemically, the nitrogenous portions are not. Moreover, since the article known now and for ages past as "butter" is an article the last step in whose manufacture is the churning of cream, it is evident that the product of an elaborate subsequent process, a process entirely foreign to the manufacture of "butter," should be designated by a distinctive name.

HOW TO DISTINGUISH GENUINE BUTTER FROM RENOVATED, AND BOTH FROM OLEOMARGARINE.

Several of the States have already enacted laws requiring the distinctive branding or labeling of the new product when offered for sale, and as a consequence chemists have, during the last year or two, devoted considerable study to methods for distinguishing between the genuine and the renovated article. One of the results of such study is the method of Hess and Doolittle (published in 1900), which is based upon the difference in the relative proportions of albumin and so-called "casein," as well as the different properties of the latter, existing in the two products. But as this is distinctly a laboratory method, quite inapplicable in the household, it will not be dwelt upon here.

Another useful method, of the nature of a preliminary test, is that of microscopic examination by polarized light, with and without the selenite plate; but for the reason just stated, this, too, will be passed with a bare mention. So also with various chemical tests and the regular chemical analysis of the fats.

HOUSEHOLD TESTS.

The boiling test.—Another important means employed in distinguishing between genuine and renovated butter is the boiling test. This test was first mentioned in scientific literature by Dr. Henry Leffmann, who states (Report of State Board of Agriculture of Pennsylvania for 1892, p. 121) that it was shown to him by a Mr. Morris, a detective in oleomargarine prosecutions. It has been in use about ten years, and was originally used only for the detection of oleomargarine; but after the advent of renovated butter the test was found to serve almost equally well in distinguishing this product from genuine butter. Therefore, this test distinguishes between genuine butter on the one hand and oleomargarine and renovated butter on the other; and, fortunately, it is so simple of execution that it can be employed in any kitchen almost as well as in the laboratory, and requires no special skill on the part of the operator. It consists merely in boiling briskly a small portion of the sample and observing its behavior the while.

In the kitchen the test may be conducted as follows: Using as the source of heat an ordinary kerosene lamp, turned low and with chimney off, melt the sample to be tested (a piece the size of a small chest-

nut) in an ordinary tablespoon, hastening the process by stirring with a splinter of wood (for example, a match). Then, increasing the heat, bring to as brisk a boil as possible, and after the boiling has begun, stir the contents of the spoon *thoroughly*, not neglecting the outer edges, two or three times at intervals during the boiling—always shortly before the boiling ceases. In the laboratory a test tube, a spoon, or sometimes a small tin dish, is used in making this test. From the last-named utensils the test is often called the "spoon test," and sometimes the "pan test."

A gas flame, if available, can be used perhaps more conveniently than a kerosene lamp.

Oleomargarine and renovated butter boil noisily, sputtering (more or less) like a mixture of grease and water when boiled, and produce no foam, or but very little. Renovated butter produces usually a very small amount.

Genuine butter boils usually with less noise, and *produces an abundance of foam.*

The difference in regard to foam is very marked, as a rule. Rarely, a butter is found which yields an uncertain result; such a butter should receive the benefit of the doubt.[1]

The Waterhouse test.—This test for the detection of oleomargarine was devised by Mr. C. H. Waterhouse, dairy instructor at the New Hampshire College of Agriculture and Mechanic Arts, not long before his death, in the summer of 1900. Previous to his sickness he described the test to Prof. C. L. Parsons, of the same college, requesting him to submit it to trial. This Professor Parsons has done, finding it entirely reliable so far as his trials extended, and the result, together with a description of the test, was published in the March number of the Journal of the American Chemical Society (p. 200).

Following is Professor Parsons's description of the test, with comments by him:

> Half fill a 100 cc. beaker with sweet milk, heat nearly to boiling, and add from 5 to 10 grams of butter or oleomargarine. Stir with a small rod, which is preferably of wood, and about the size of a match, until the fat is melted. The beaker is then placed in cold water and the milk stirred until the temperature falls sufficiently for the fat to congeal. At this point the fat, if oleomargarine, can easily be collected together into one lump by means of the rod, while, if butter, it will granulate and can not be so collected. The distinction is very marked.

[1] A very few samples of "ladled" butter have been observed in this laboratory to yield a rather scanty foam. "Ladled" butter is the product obtained by working together, and washing at the same time, several different lots of "country butter," coloring the whole to a uniform shade. The best grade is sometimes sold for table use, lower grades go for cooking; but it is becoming less and less abundant in the market, especially the lower grades, since it is being largely replaced by renovated or "process" butter.

The stirring is not, of necessity, continuous during the cooling, but it should be stirred as the fat is solidifying and for a short time before.

The milk should be well mixed before being turned into the beaker, as otherwise cream may be turned from the top and contain so much butter-fat that the test is vitiated for oleomargarine.

In conclusion, Professor Parsons says:

While the small number of samples (21) of oleo to which the test has been applied will not allow of a positive statement of its universal application, I am convinced from my own experience that it will prove of value, especially in the hands of revenue agents and others employed in detecting illegal sales of oleomargarine, as it may materially lessen the number of samples to be sent forward for the final proof of chemical analysis. If this test is found to be of use, it should be known as the Waterhouse test.

DEPARTMENT EXPERIMENTS WITH THE WATERHOUSE TEST.

This remarkable and simple test, in a slightly modified form adapted to household conditions, has been quite carefully studied in the chemical laboratory of the Department of Agriculture, with the result of finding that while oleomargarine gathers in the manner stated by Professor Parsons (except when cooled very rapidly indeed, as by a large quantity of ice water, when it granulates instead of gathering), renovated butter also gathers, but is prevented from so doing and made to granulate by a less rapid cooling, as by using a smaller quantity of ice water; and, finally, that some samples of genuine butter, or presumably genuine butter, purchased as such in the open market, will gather when cooled very slowly by means of water only moderately cold and when partially skimmed milk is used in the test.

These facts make it evident that in using the Waterhouse test extreme care is essential in regard to rapidity of cooling if oleomargarine is to be distinguished from renovated butter. We have, however, found it quite possible to make this distinction with a high degree of certainty by controlling the rapidity of cooling by means of ice and a limited amount of ice water, as well as by a uniform method in regard to the stirring.

THE WATERHOUSE TEST, AT ICE-WATER TEMPERATURE, ADAPTED TO HOUSEHOLD CONDITIONS.

The household adaptation of the test which we here present has given us excellent satisfaction in a large number of trials with oleomargarines and both renovated and genuine butters.

Since the results of the test are easily changed by rather small variation of the conditions, or the details of manipulation, it is important to follow the directions carefully in every detail. If this is not done, erroneous results may be obtained.

TO DISTINGUISH OLEOMARGARINE FROM RENOVATED AND GENUINE BUTTERS.

Utensils required.—The utensils required in the test to distinguish oleomargarine from renovated and genuine butters are as follows:

(1) A one-half pint tin "measuring cup," common in kitchen use, marked at the half and quarters; or a plain one-half pint tin measure, ordinary narrow form; or an ordinary small tin cup, $2\frac{3}{4}$ inches in diameter and 2 inches in height, holding about one gill and a half.

(2) A common kitchen pan, about $9\frac{1}{2}$ inches in diameter at the base.

(3) A small rod of wood, of the thickness of a match and of convenient length for stirring.

(4) A clock or watch.

The process.—The process for distinguishing oleomargarine from renovated and genuine butters is as follows:

Use sweet skimmed milk, obtained by setting fresh milk in a cool place for twelve to twenty-four hours and removing cream as fully as possible. Half fill with this milk the half-pint cup or measure, or two-thirds fill the smaller cup mentioned, measuring accurately the gill of milk when posssible; heat nearly to boiling, add a slightly rounded teaspoonful of the butter or butter substitute, stir with the wooden rod, and continue heating until the milk "boils up,"[1] remove at once from the heat and place in the pan (arranged while milk and fat are heating) containing pieces of ice with a very little ice water, the ice to be mostly in pieces of the size of one to two hen's eggs (not smaller, as small fragments melt too rapidly) and sufficient in quantity to cover two-thirds of the bottom of the pan; the water to be in quantity sufficient, when the cup is first placed in the pan, to reach on the outside of the cup to only one-fourth the height of the milk within; any water in excess of that amount must be removed. [This refers to the condition at the beginning of the cooling; later, as the ice melts, the water will rise to a higher level.] Stir the contents of the cup rather rapidly, with a rotary and a cross-wise motion in turn, continuously throughout the test, except during the moment of time required for each stirring of the ice and water in the pan, which must be done thoroughly once every minute by the clock. This is done by moving the cup about, in a circle, following the edge of the pan. Proceed in this manner for ten minutes, unless before that time the fat has gathered or has allowed itself to be easily gathered, in a lump or a soft mass, soon hardening. If it so gathers, the sample is oleomargarine; if not, it is either genuine or renovated butter.

Thus far in our experience the results obtained by the test operated in this manner, carefully and with due regard to details, have been

[1] This slight departure from the original Waterhouse test is in order to secure always the same temperature of the milk.

always correct and free from uncertainty, with only two exceptions. These exceptions were two very stale and rancid samples of oleomargarine that had been in the laboratory several months and had become entirely unfit for culinary use; in fact, one had become oily and moldy. Fortunately, such samples do not require testing in the household, and a rancid oleomargarine is easily distinguished from a rancid butter by the sense of smell alone.

In several other samples of stale and rancid oleomargarine we have observed the tendency exhibited by the two just mentioned, namely, a tendency to be kept from gathering—that is, to become granulated—by a temperature slightly less cold than is required to prevent fresh oleomargarine from gathering. But of the eight such samples we have tested, only the two mentioned were sufficiently erratic in their behavior to escape detection by the test.

The boiling test ("spoon test"), given on page 6, enables one to distinguish in the great majority of cases between genuine butter on the one hand and oleomargarine and renovated butter on the other; the Waterhouse test, household adaptation as just given, enables one to distinguish between the two last named; and so, by the use of the two tests, one can determine in nearly every instance which of the three he has in hand. There are many persons who are able to recognize oleomargarine, almost without fail, by taste and smell alone. To those possessed of this power the boiling test, which is performed with almost no trouble, will serve every needful purpose.

FUTURE MIXTURES MAY BE DIFFICULT OF DETECTION.

It will be readily understood that mixtures, should such be put upon the market at any future time, might be comparatively difficult of detection by these simple tests; also that possible changes in the mode of manufacture might have the same result; but, as the products are at present commonly met with, these tests should prove useful to purchasers and housekeepers.

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